

Assimilating Data into a Circulation Model

Final Report for ONR Project #:N00014-02-1-0212

Submitted by

Dr. Jennifer Shore and Dr. Thomas Lippmann

The Ohio State University
Byrd Polar Research Center
1090 Carmack Road
Columbus Ohio 43210-1002

Date Submitted: 5 December 2005

20051212 035

| REPORT DOCUMENTATION PAGE | | | | Form Approved OMB No. 0704-0188 | |
|--|----------------------|--|---|--|---|
| <small>The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</small> PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS. | | | | | |
| 1. REPORT DATE (DD-MM-YYYY) 12/05/05 | | 2. REPORT TYPE Final Technical Report | | 3. DATES COVERED (From - To) 1/1/02-3/31/05 | |
| 4. TITLE AND SUBTITLE Assimilating Data into a Circulation Model. | | | | 5a. CONTRACT NUMBER | |
| | | | | 5b. GRANT NUMBER N00014-02-1-0212 | |
| | | | | 5c. PROGRAM ELEMENT NUMBER | |
| 6. AUTHOR(S) Lippmann, Thomas C. Shore, Jennifer | | | | 5d. PROJECT NUMBER | |
| | | | | 5e. TASK NUMBER | |
| | | | | 5f. WORK UNIT NUMBER | |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) The Ohio State University Research Foundation 1960 Kenny Road Columbus Ohio 43210 | | | | 8. PERFORMING ORGANIZATION REPORT NUMBER | |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Thomas G. Drake Office of Naval Research Ballston Centre Tower One 800 North Quincy Street Arlington, VA 22217-5660 | | | | 10. SPONSOR/MONITOR'S ACRONYM(S) | |
| | | | | 11. SPONSOR/MONITOR'S REPORT NUMBER(S) | |
| | | | | | |
| 12. DISTRIBUTION/AVAILABILITY STATEMENT Report available upon request - Unclassified | | | | | |
| 13. SUPPLEMENTARY NOTES | | | | | |
| 14. ABSTRACT The purpose of this grant was to develop data assimilation methods for state-of-the-art nearshore oceanographic circulation models. The data for the assimilation effort was provided from the collaborative Nearshore Canyon Experiment (NCEX) held in the fall of 2003. This research led to the development and implementation of a time-distributed averaging procedure (TDAP) within the Ozkan-Kirby (OK) nearshore circulation model to assimilate dense surface velocity observations obtained at NCEX. | | | | | |
| 15. SUBJECT TERMS Nearshore processes; Data Assimilation; Nearshore Canyon Experiment (NCEX); Surf zone circulation | | | | | |
| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT UU | 18. NUMBER OF PAGES 2 | 19a. NAME OF RESPONSIBLE PERSON Dr. Thomas Lippmann |
| a. REPORT U | b. ABSTRACT U | c. THIS PAGE U | | | 19b. TELEPHONE NUMBER (Include area code) 614-688-0080 |

ONR Final Report for N00014-02-1-0212

Principal Investigators: Dr. Jennifer Shore and Thomas C. Lippmann

**The Ohio State University
Byrd Polar Research Center
1090 Carmack Road
Columbus Ohio 43210-1002
Email: Lippmann.2@osu.edu**

The purpose of this grant was to develop data assimilation methods for state-of-the-art nearshore oceanographic circulation models. The data for the assimilation effort was provided from the collaborative Nearshore Canyon Experiment (NCEX) held in the fall of 2003. This research led to the development and implementation of a time-distributed averaging procedure (TDAP) within the Ozkan-Kirby (OK) nearshore circulation model to assimilate dense surface velocity observations obtained at NCEX.

The OK model is a depth- and phase-averaged nearshore circulation model based on the shallow water horizontal momentum and continuity equations with wave forcing, bottom friction, and lateral mixing. In this work, observations of surface flows are assimilated into the model using the TDAP nudging approach following the work of Oke, *et al.*, 2004, *J. Geophys. Res.*, **107**(C5), 5-25). Presently, the assimilation scheme has been tested with a subset of the NCEX data. A paper is under preparation for submittal intended for the Journal of Geophysical Research. Methods learned under this grant are being extended for use with other nearshore circulation models including Delft3d under continued ONR funding.

The following is a list of publications and presentation supported by this grant.

Publications:

Shore, J., T. J. Kassebaum, and T. C. Lippmann, 2005, PC based analog video data collection technique for nearshore waves and currents, *J. Ocean. Atmos. Tech.*, sub judice.

Presentations at National and International Meetings:

Lippmann, T. C., 2004, Surface currents in the nearshore, *ONR progress review northeast region*, Woods Hole, MA.

- Shore, J., T. C. Lippmann, and J. Long, 2004, Assimilation of surface currents in a nearshore circulation model, *Trans. Amer. Geophys. Union*.
- Lippmann, T. C., D. Welsh, and J. Shore, 2004, Video-derived surface current measurements during NCEX, *Trans. Amer. Geophys. Union*.
- Lippmann, T. C. , D. Welsh, and J. Shore, 2002, Observations of mean and oscillatory surface flow in the surf zone, *Trans. Amer. Geophys. Union*, 83(47), F717..
- Lippmann, T. C., and J. Shore, 2001, Video-based observations of surface currents in the surf zone, *Trans. Amer. Geophys. Union*, 82(47), F617.